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OFFICE OF THE SECRETARY OF

NORTH ATLANTIC ASSEMBLY
ASSEMBLÉE DE L'ATLANTIQUE NORD

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STC/AT - EE/jvc

29 January 1985

Dear Mr. Weinberger,

In October 1963, the North Atlantic Assembly created a Sub-committee on Advanced Technology and Technology Transfer in order to study how the Alliance nations can make better use of their technological resources. A key part of the Sub-committee's work is an investigation of the Alliance's technology transfer problems.

At the Assembly's latest meeting, held in Brussels in November 1984, the Sub-committee presented its first report as a result of which the Assembly passed a resolution on technology transfer. The resolution proposes a number of measures - described in some detail in the report - which the Sub-committee feels would greatly alleviate the Alliance's technology transfer difficulties.

Consequently, as Chairman of the Sub-committee, I am sending copies of the report and the resolution to officials, in all the Alliance nations, who are involved in technology transfer. I hope that you, as one of these officials, will find the material useful and constructive. I would also be very grateful if you would inform the Sub-committee of your appraisal of its proposals.

A document on the responses to our proposals is being compiled by Mr. David Robbs, Director of the Assembly's Scientific and Technical Committee, so I would be grateful if you could send your appraisal directly to him. Personally however, if you have any queries on this matter, please do not hesitate to contact me.

Yours sincerely,

Senator Earl Hastings
Chairman: Sub-committee on
Advanced Technology and
Technology Transfer

Mr. Caspar WEINBERGER
Secretary of Defence
The Pentagon
USA - WASHINGTON DC 20301

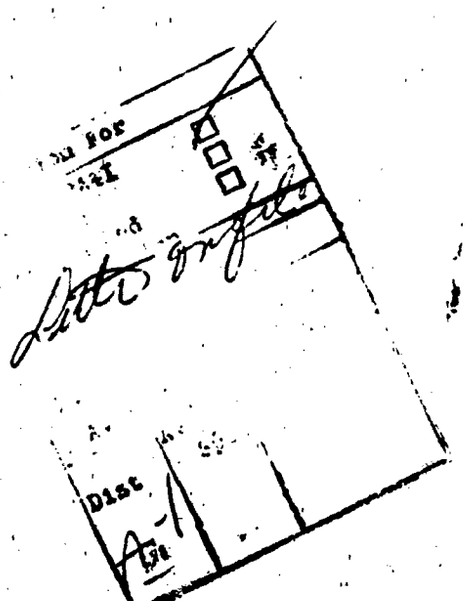
URGES member governments of the North Atlantic Alliance:

1. to consider the added expense, in terms of effort and resources, of the disagreement on technology transfer policies, and to assess the savings and benefits of reaching a compromise on these policies;

2. to consult with the United States in a reappraisal of the Military Critical Technologies List in order to decrease restrictions on technologies which are already available outside the United States;

3. to consider the creation, in each Alliance nation, of a Technology Transfer Bureau to assume overall responsibility for dealing with high-technology exports, and to report their views to the Assembly;

4. to consider the creation of an Alliance Technology Agency to harmonise research and development in the Alliance nations in order to rationalise the Alliance research and development effort by identifying opportunities for collaboration and reducing unnecessary duplication, and to report to the Assembly on the action taken.



NORTH ATLANTIC ASSEMBLY

AB 271
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Resolution 156

On Technology Transfer *

The Assembly,

Recalling its 1983 Resolution (146) on East-West Technology Transfer, which stressed the need to formulate a coherent Alliance approach to the export of high technology goods to the Eastern bloc;

Concerned by the acquisition and exploitation of Western technology by the Eastern bloc to enhance Soviet and Warsaw Pact military capabilities;

Agreed that the flow of Western technology to the Eastern bloc must not be permitted to compromise Western security;

Welcoming recent agreements at the Co-ordinating Committee on Multilateral Export Controls (COCOM) for regulating exports of certain high technology items; but

Convinced that actions must be taken outside the COCOM framework in order to harmonise fully the Alliance nations' high-technology export policies ;

Aware of difference of opinion between Alliance nations over the export of high-technology goods;

Concerned that these differences of opinion are restricting the transfer of technology between the Alliance nations and limiting opportunities for collaboration in high-technology projects;

Disturbed by unnecessary duplication in Alliance civil and military research and development efforts;

Persuaded that a more rationalised Alliance research and development effort could be facilitated by resolving the different approaches to high technology exports;

Recognising that although the Assembly's Sub-Committee on Advanced Technology and Technology Transfer has only just started its work, it is still convinced that immediate action can be taken;

* Presented by the Scientific and Technical Committee.

NORTH ATLANTIC ASSEMBLY

SCIENTIFIC AND TECHNICAL COMMITTEE

INTERIM REPORT

of the

SUB-COMMITTEE ON ADVANCED TECHNOLOGY AND TECHNOLOGY TRANSFER

Mr. Lothar IBRÜGGER (Fed. Rep. of Germany)
Rapporteur

NOVEMBER 1984

NORTH ATLANTIC ASSEMBLY

SCIENTIFIC AND TECHNICAL COMMITTEE

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In accordance with Article 30, paragraph 3, of the Rules of Procedure, this Report was taken of by the Committee.

International Secretariat
November 1984

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STC/AT (84) 5
Original : English

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Rapporteur :	Mr. Lothar Ibrügger (Fed. Rep. of Germany, SPD)
Members :	Mr. Joao Ferraz de Abreu (Portugal, PS)
	Mr. Robert Aumont (France, PS)
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	Mr. Jorgen Sonstebo (Norway, Christian People's Party)
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	Mr. David Hobbs, Director, Scientific and Technical Committee

SUB-COMMITTEE ACTIVITIES : 1984

14-17 FEBRUARY : PARIS, LYON (FRANCE)

Meetings with O.E.C.D., Electricité de France, officials from the Ministry of Foreign Affairs and members of parliament.

7-11 MAY : OTTAWA, TORONTO (CANADA) AND WASHINGTON (UNITED STATES)

Meetings in Canada with officials from the Department of National Defence, the Department of External Affairs, the Ministry of Science and Technology, academic institutions and high-technology companies: in the United States with officials from the Department of Defense, the Department of State, the Office of Technology Assessment, high-technology companies, and independent security analysts.

4-9 NOVEMBER : HAMBURG, BREMEN, PADERBORN, COLOGNE, FRIEDRICHSHAFEN, MUNICH (FEDERAL REPUBLIC OF GERMANY)

Meetings with high-technology companies (aerospace, computers, biotechnology, etc.), officials from the Ministry of Economics, the Ministry of Science and Research for North-Rhine-Westfalia, and research institutions.

SUMMARY

North Atlantic Assembly's

This is the first Report of the Sub-Committee on Advanced Technology and Technology Transfer and so the Report commences with a description of the Sub-Committee's areas of interest, viz. Technology Transfer, High Technology Research, and High Technology and Economic Growth.

This Report concentrates on technology transfer, describing the flow of Western technology to the Eastern bloc and how this assists the Soviet Union and its allies. The Report then examines the differing views on East-West technology transfer and what effect this has on the transfer of technology between Alliance nations. Next,

Following this, there is a description of the relative technological performance of the United States and the Allies. Finally, the Report draws together many of the themes raised in order to formulate some specific policy proposals intended to help resolve disagreements on technology transfer. These proposals would involve reorganising the way in which Alliance nations licence high technology exports, and the creation of an Alliance technology agency both to streamline the Alliance's exploitation of technology and to harmonise exportation policies.

CHALLENGES FOR TECHNOLOGY POLICY

A. INTRODUCTION

1. Advanced technology plays an ever-increasing role in society. To cite just a few examples, in the military sector, new technologies raise the prospect of constructing defences against ballistic missiles, and the "emerging technologies" might radically improve NATO's combat-effectiveness and raise the nuclear threshold : in the civilian sector, advanced technology might lead to the industrialisation of space, the production of exceptionally powerful computers, the utilisation of new sources of energy, and the development of new pharmaceuticals. The exploitation of new technology is of crucial importance to NATO strategy since the Alliance relies on its technological superiority to offset Warsaw Pact numerical superiority and, more generally, progress in technology is a key element in the economic health of Western nations.

2. On several occasions, the Scientific and Technical Committee has examined scientific and technical co-operation and competition within the Alliance, and recently the Committee has devoted much attention to the problems of East-West technology transfer. A larger, systematic study of Alliance technology policies would thus be a natural continuation of the Committee's work which might make a significant contribution to the formulation of a coherent Alliance approach to advanced technology. Consequently this study -- to be undertaken by the Sub-Committee on Advanced Technology and Technology Transfer -- will investigate the problems and opportunities that advanced technology presents in order to contribute to the orchestration of co-ordinated Alliance research and development policies and priorities. This study of technology policy falls into three related areas : technology transfer, high technology research, and high technology and economic growth.

1. Technology Transfer

3. The most obvious aspect of this problem is raised by the flow of Western high-technology goods and expertise to the Eastern bloc. The closing technological gap between East and West is viewed with alarm, particularly in the military sector where Soviet capability is clearly being enhanced by the absorption of Western technology and know-how. However, while all Alliance nations agree that these technology transfers should not be permitted to jeopardise Western security, there is disagreement about which areas of technology should be limited and how restrictions should be enforced. Furthermore, assessments of the impact of technology transfer to the Eastern bloc differ. Hungary and Poland are two countries cited as examples of regimes which were able to loosen their ties with the Soviet Union, in part because they benefited from Western technology. On the other hand, there is no doubt that much Western technology which has found its way to the Eastern bloc is used in Warsaw Pact weapons.

4. A particularly troublesome area is the "dual-use" technology, technology which has both civil and military applications. Essentially, there is no consensus on where to draw the line on dual-use technologies, nor on the balance of commercial and political benefits versus the security costs of technology transfer. This is an especially complex issue because not only are national viewpoints sometimes at variance, but even domestic factions -- corporate interests, trade and defence departments -- adopt different stances.

5. As a result of all these differing perceptions of East-West technology transfer, the flow of technology between Western nations has been hindered. Much concern has been expressed over the extent to which West-West technology transfer has suffered as a consequence of efforts to stem the flow of militarily significant technology to the East. In its work the Sub-Committee should attempt to identify the areas of agreement and disagreement regarding technology transfer and should seek to promote greater understanding and co-operation among Alliance nations.

ii. High Technology Research

6. Technological competition can stimulate progress but much research and development performed within the Alliance is duplicative. In part, duplication results from restrictions imposed on West-West technology transfer but a lack of co-ordination is also to blame. Greater co-operation would enable scarce research funds to be allocated more effectively, and more harmonised technology policies would facilitate a freer flow of technology and expertise within the Alliance. This issue is of critical importance since advanced technology projects can require very large-scale investment and a much-desired increase in co-operation in defence programmes would require a greater pooling of technological resources. The Sub-Committee on Advanced Technology and Technology Transfer should investigate technological competition between Western nations with a view to discovering the factors which impede collaboration and to try to assess where there are further opportunities for international co-operation.

iii. High Technology and Economic Growth

7. New technology clearly plays a crucial role in national economies yet there is no obvious relationship between research effort and economic achievement. For instance, the European Community spends more than twice as much as Japan on commercial innovation but the contacts between high technology companies, universities and research institutions remain more tenuous in Europe than in Japan or the United States. In this context, it is important to assess key areas of new technology which Alliance nations need to develop in order to maintain economic competitiveness with each other and with Japan and other industrialised countries. Furthermore, the

problem of translating technical inventions into successful technological innovations should be examined. There is a need to discover how technology policy can be formulated in order to stimulate the exploitation of new technology. Therefore, the Sub-Committee should examine the new technologies which are expected to contribute to economic growth and the mechanisms whereby these new technologies can be absorbed by industry.

8. Essentially, disarray in Alliance technology policies is detrimental to trade, technological progress, economic health, weapons procurement and, indeed, Alliance cohesion. Furthermore, new technologies affect a growing circle of activities and Alliance legislators are being called upon to regulate their impact on national economies, trade and defence. Thus the formation of the Sub-Committee on Advanced Technology and Technology Transfer is both timely and useful. The purpose of this Report is firstly to describe the problems which face the Alliance in the areas of East-West and West-West technology transfer. Secondly, and most importantly, the Report makes a number of proposals about how these problems might be solved.

B. EAST-WEST TECHNOLOGY TRANSFER

9. For twenty years after World War II, the United States controlled exports to the Soviet bloc very closely. The United States reasoned that the Soviet Union should be denied access to the Western economic system in order to protect and preserve a major Western advantage in the overall strategic competition. Western economies were stronger, more flexible and innovative, and much more responsive to consumer demands than was the Soviet economy. American restrictions on East-West trade were intended to exploit Soviet economic weaknesses by forcing the Soviet Union to divert resources to the civilian economy that could otherwise have been used to promote even stronger conventional and strategic weapons programmes. The Export Control Act of 1949 allowed the President to establish a long and comprehensive list of controlled commodities, including items of economic and military significance.

10. In 1962, the Act was amended to strengthen and broaden the control of economically important goods. The Executive was directed to deny licences for any export that would make a significant contribution to the military or economic potential of nations threatening the security of the United States.

11. From the mid-1960s, this hard-line approach began to soften. Priority was given to economic rather than to strategic considerations. American diplomatic and foreign-trade officials joined forces to argue that increasing commercial ties with the East could both lessen the tensions of the Cold War and offer new markets for Western products. President Johnson spoke of "expanding trade" with the Soviet bloc as part of a policy of "building bridges" with the East. President Nixon sought a period of "co-operation" replacing one of "confrontation".

12. This mood was reflected in the Export Administration Act of 1969. This declared that United States policy was to "encourage trade with all countries with which we have diplomatic or trading relations". The Act also noted that trade restrictions harmed the United States' balance of payments. Under the terms of the Act, the Secretary of Commerce was authorised to revise control regulations and to shorten the lists of controlled commodities by removing items of purely economic or of marginal military use.

13. In sum, in the late 1960s and early 1970s, the American view on technology transfer was this. Co-operation in trade reduces tension, opens new markets and eases balance of payments difficulties. In this climate, the Soviet Union will pay greater attention to the neglected consumer needs of its people. Thus, with a little encouragement, the Soviet Union will place less emphasis on its military procurement programmes and more on the consumer sector.

14. This, of course, was not to be the case. The Soviet military build-up continued and military force was used increasingly around the world, either directly or through surrogates. And what was especially irritating about the Soviet military build-up was that Western technology was being incorporated in many items of hardware. Indeed, it became evident that the Soviet Union had embarked on a large-scale, systematic effort to acquire Western technology.

C. THE SOVIET ACQUISITION EFFORT

15. The Soviet Union acquires Western technology by four principal channels : legal purchases of "dual-use" technology, the legal exploitation of open sources of information, the illegal purchase of technology, and espionage (1).

1. Legal Purchases

16. There are many examples of the Soviet Union purchasing technology for ostensibly civilian purposes and then exploiting that technology's military potential. The Kama River Truck Plant was built over a period of seven years with over $1.5 billion worth of American and Western European automotive equipment and technology. The West was assured that only civilian vehicles would be produced in the plant, yet Kama River trucks were reported to have joined the inventory of the Soviet forces in Germany in the summer of 1977. Kama River trucks also rolled into Afghanistan with Soviet forces in late 1979 and early 1980.

17. In the early 1970s, the Soviet Union bought over 160 precision-grinding machines from an American company. These machines allowed the Soviet Union to manufacture large volumes of small, high-precision bearings for its strategic missiles much sooner than would have been possible had the Soviet Union been compelled to rely on its own resources. These bearings improved the accuracy of Soviet missiles, a development which caused much concern.

18. In the late 1970s, the Soviet Union purchased two large floating dry docks, one from Japan and one from Sweden. The Soviets gave their assurance that these vessels would only be used to service merchant vessels but they were diverted to military service, one in the Soviet Pacific Fleet and the other in the Soviet Northern Fleet. These are the only floating dry docks capable of servicing the Kiev-class V/STOL carriers, and will assume even greater significance when the Soviet Union constructs large carriers for high-performance aircraft, as is anticipated for the 1990s. No Soviet shipyard would have been capable of accommodating the construction of such dry docks without major modification and substantial capital outlay.

19. Oceanographic survey vessels fitted with some of the most modern Western equipment have also been purchased, possibly assisting progress in Soviet anti-submarine warfare capabilities.

20. Since 1969, the Soviet Union has been developing a family of general-purpose computers known as the Ryad series. These computers comprise virtually the entire Soviet and East European effort in large, general-purpose computers, and are used in a wide variety of civil and military applications. Western technology has aided their development by furnishing design directions both at the system and component levels. Indeed the architecture of these computers so closely resembles the IBM 360 and IBM 370 machines that the repair manuals are the same.

11. Legal Exploitation of Open Sources.

21. In addition to purchasing Western technology directly and openly, the Soviets make extensive use of open sources and scientific exchanges to acquire technology. Soviet representatives regularly attend high technology trade exhibitions and visit commercial firms, particularly smaller companies that are developing new technologies. Approximately 2 500 Soviet engineers and scientists go to the United States annually on trade missions. These apparently trade-promotion efforts often conceal attempts to acquire Western technology, sometimes before its military applications have been identified and security restrictions imposed.

22. Sometimes Soviet officials order and receive blueprints from Western high technology companies. Thus, Soviet military aircraft designers obtained plans and drawings for the C-5A transport aircraft early in its development cycle. Contractors who lose in competitive development programmes can, and do, release information on their products quite rapidly and whenever possible the Soviets take advantage of this. Western universities are also targets: Eastern bloc scientists have worked in the West on militarily relevant fields such as aerodynamics, cryogenics, optics, lasers, computers, nuclear microelectronics, and structural and electronic materials. Published journals and reports are also used extensively. One estimate suggests that 1 000 Soviet officials in the United States glean information from open sources. One incident illustrates this very well.

23. In 1979, two Soviet embassy officials travelled to Tennessee where they visited the public library and copied pages from an environmental statement concerning government construction of a plant to manufacture military explosives. A subsequent investigation revealed that the environmental impact statement contained a wealth of technical details which, when combined with other published data, could enable the Soviet Union to duplicate the entire manufacturing process involved.

III. Illegal Acquisition of Technology

24. Naturally, much of the technology sought by the Soviet Union cannot be obtained legally. Consequently, the Soviets employ a variety of methods to obtain it. Generally, this type of technology is purely military or is "dual-use" but with very clear military utility.

25. One technique is break trade embargoes using "front" companies to ship technological goods to a false company in a country not subject to embargo, and then to ship the goods to the Soviet Union. One example of this involved West German businessman Werner J. Bruchhausen. Bruchhausen travelled frequently between his home in West Germany and California's Silicon Valley where he established a group of companies marketing electronics and high-technology items. His actual business was to export - illegally - some of the latest semiconductor manufacturing equipment to Eastern Europe and the Soviet Union. In a four-year period about a dozen of Bruchhausen's companies evaded American export controls and sent more than $10 million worth of computer chips and electronics equipment through European countries to the Eastern bloc. Included in more than 300 illegal shipments was all the equipment required to build a state-of-the-art semiconductor manufacturing plant.

26. Another example was a California optics company which illegally sold 50 high-energy laser mirrors to the Soviet Union. False export documents were used to conceal the contents and destination of the shipments which, according to one estimate, saved the Soviet Union millions of dollars and almost one hundred man-years of research and development effort. In a further case, a Swedish company, Datasaab Contracting AB, supplied the Soviet Union with American circuitry and software which was used to give the Soviet air-traffic network the capability of tracking military aircraft. Another case involved the sale of an electronics manufacturing facility which had been assembled without arousing suspicion by ordering components from 50 companies in six countries. This facility may save the Soviet Union five years' research time and bring manufacturing economies of $80 million annually for 10 years.

iv. Espionage

27. The exact nature and scale of this form of acquisition is obviously difficult to evaluate. A year ago, the Federal Bureau of Investigation was reported to be investigating at least 35 cases of espionage in Silicon Valley alone (2). Not all cases are large but some have been extremely damaging as can be seen from two well-publicised espionage cases. The first concerns William H. Bell, formerly an employee of the Hughes Aircraft Corporation, and now serving an 8-year jail sentence. In 1977 Bell struck up a friendship with a Polish agent, ostensibly working for a company which acted as a consultant to firms exporting machinery parts and tools to Poland. The agent offered financial assistance to Bell -- who was in financial straits -- in return for unclassified documents. Bell was thus compromised and became a willing suppliers of classified information. For a total of $110 000, Bell handed over details of many items of military equipment ranging from the F-15 look-down-shoot-down radar and the quiet radar for B-1 and Stealth bombers, to a ship-borne surveillance radar and a towed array submarine system. In another case, a freelance electronics engineer, James Deverard Harper, was paid more than $250,000 by the Polish Intelligence Service over a four-year period in return for classified documents on strategic missiles and ballistic missile defence technology. The value of the documents to the Soviet Union has been described as "beyond calculation". Harper was sentenced to life imprisonment.

D. SOVIET GAINS FROM TECHNOLOGY TRANSFER

28. The benefits to the Soviet Union from all these forms of technology transfer are all too obvious but it is worthwhile underlining them explicitly.

29. Firstly, it closes the technological gap between East and West. Since the West relies traditionally on its technological superiority to off-set its numerical inferiority, this is clearly an alarming state of affairs. To cite just one example of the West's diminishing technological lead, in the mid-1960s Western computer and microelectronic technology was estimated to be 10 to 12 years ahead of the Soviets. That lead is now down to three to five years.

30. Second, the Soviets save hundreds of millions of dollars in research and development costs : savings resulting from the elimination of costly and time-consuming research and development, and lower research and development costs in manufacturing final products. Third, the Soviets achieve greater weapons performance, and countermeasures against Western weapon systems can be produced more rapidly and cheaply. Fourth, it contributes to the overall growth of the Soviet economy by enhancing productivity and, fifth, the West has to spend more and more to try to maintain its technological lead and counter the increasingly potent Soviet military threat.

E. THE EXPORT ADMINISTRATION ACT

31. Concern about East-West technology transfer led the United States to tighten its export laws considerably. In 1979, a new Export Administration Act was introduced. Under this Act, exports can be controlled for three purposes :

-- To protect national security
-- To achieve foreign policy goals
-- To prevent the depletion of goods in short supply.

32. This Act covers not just technology which strengthens Soviet military power, but also technology which strengthens the entire Soviet industrial base and energy infrastructure. The broad thrust of the Act is to prevent the Soviet Union from compensating for its relative inability to innovate by acquiring technology from the West. Given the problems of technology transfer described above, this might seem a wholly reasonable course of action to undertake. However, the Export Administration Act has been criticised by commercial interests and by the United States' Allies.

F. TECHNOLOGY TRANSFER : AN ALTERNATIVE PERSPECTIVE

33. The Europeans view East-West trade relations as an integral part of their relations with the Soviet Union. They believe in pursuing a dual policy towards the Soviet Union ; maintaining military strength while continuing the dialogue with the Soviet Union. Trade is seen as an important part of this dialogue. Economic relations are seen as a stabilising factor, reinforcing the Soviet Union's incentive not to

disturb the European status quo. Economic relations are seen as a normal and desirable aspect of East-West relations. According to this view, the question is not whether or not to trade with the Soviet Union, but how to do so under optimal conditions. Essentially, the European concept of security differs from that of the United States. The United States' concept of security stresses the military dimension, whereas the European concept also emphasises the economic aspects.

34. Europeans feel that East-West trade is mutually beneficial, contributing to the health of Western economies as much as it does to the Soviet economy. The reason for this is that West European economies are much more trade-dependent than is the United States' economy, and a robust export sector is seen as essential. Europeans do not believe that the West can -- or should try to -- bring about a Soviet economic crisis and certainly do not feel that the power to effect a collapse of the Soviet economy lies in Western hands. And, in any event, a crisis in the Soviet economy is seen as being potentially dangerous since the Soviet Union is likely to become more belligerent in the face of major economic problems than if its economy were functioning acceptably. On the Siberian gas pipeline issue, for example, West Europeans thought that assisting the Soviet Union in developing domestic energy reserves had positive security benefits. It was seen as diminishing Soviet interest in securing energy supplies from the Gulf, thus impinging on Western security interests. Europeans also objected to American sanctions which would have cost Europe far more than the United States. It is argued that trade sanctions never affected Soviet behaviour over Afghanistan or Poland even though some economic hardship may have been imposed. Trade is seen as only a marginal influence on Soviet behaviour, affecting issues such as emigration, but even then only if trade is used a carrot rather than a stick.

35. In addition, Western Europe sees trade as a means of forging ties with Eastern Europe and stimulating East European independence from the Soviet Union. Hungary is cited as an example of this. Trade and joint commercial ventures, it is suggested have assisted Hungary to develop its unique economic system which encourages a significant degree of decentralisation and private enterprise. In this view, Hungary's successful economic policies have facilitated the growth of a political climate permitting more individual freedom than that in the Soviet Union. It is also suggested that Poland's intensified economic and political links with the West in the 1970s encouraged greater individual expression, leading finally to the creation of an independent trade union.

36. This approach to East-West trade is also siezed upon by various corporate interests in the United States. They point out that much of the technology embargoed by the United States is available elsewhere and that American sanctions only inhibit American exports. Also, licensing formalities can take so long that Eastern bloc nations look elsewhere when the same goods can be obtained more quickly.

37. For instance, as a result of the pipeline sanctions, the Caterpillar Tractor Company lost a $90 million order for 200 pipe-laying tractors. These were purchased from Caterpillar's Japanese rival Komatsu. The effect of this was to close the Soviet market to Caterpillar even after the sanctions were lifted and Caterpillar's reputation for reliability was injured in other countries. When the Soviet Union decided to buy 500 new pipe-layers, Caterpillar was not even asked to bid on the project and the $200 million contract went to Komatsu (3).

38. American firms also point out that the Department of Defense's list of Military Critical Technologies which cannot be exported to the Soviet Union is ridiculously large and cumbersome. The Military Critical Technologies List (MCTL) is over 700 pages long and critics maintain that the United States has a monopoly on only 15% of the items on it (4).

6. WEST-WEST TECHNOLOGY TRANSFER

39. The Alliance nations acknowledge their differences of opinion regarding trade with the East and attempt to co-ordinate export policies through a Co-ordinating Committee on Export Controls known as COCOM. This Committee has representatives from all the NATO nations except Iceland and Spain, and also includes Japan. COCOM occupies a few offices in the American embassy in Paris and by mutual agreement restricts the goods which can be sold to the Eastern bloc. The COCOM list of proscribed goods is, however, smaller than the American list: the United States restricts more items than do the other Western Allies. As a consequence of this, the Americans also restrict the sale of certain goods to the Western Allies.

40. For example, in 1987 the United States banned the sale of the Cray computer system to France. Consequently, the French defence ministry turned to the state-owned Bull computer firm to develop its own super-computer system, ISIS, to be available to the French armed forces by 1985. In this case, the American ban has had an invigorating influence on the French computer industry. France will acquire the relevant technology and may become a competitor in this type of equipment not - as might have happened - a dependant (5).

41. When the Scientific and Technical Committee of the North Atlantic Assembly visited the European Space Research and Technology Centre in the Netherlands, one of the facilities examined was devoted to the development of advanced power supplies for satellites. One of the scientists there commented that the United States produced much better power supplies but their sale to Europe was prohibited by American export regulations.

42. Advanced computer languages and programmes developed in the United States are being withheld from research in the United Kingdom. Computer scientists have been unable to import software for the computer-aided design of very large scale integrated circuits, as well as being denied access to a new method of checking that programmes work correctly. ICL, a major British computer manufacturer, sells around L35 million worth of computers to Eastern Europe each year and most contain American components. The company has experienced significant delays in obtaining export licences for these computers and ICL is clearly concerned about these restriction.

43. Plasma Technology, a British supplier of chip-making equipment revealed that it had been refused an export licence by COCOM to ship an order to China. Yet an American competitor operating from a Swedish subsidiary had sold identical equipment to China. John Bradburn Computer Services was denied further supplies of electronic equipment from the United States. The equipment, which involves a talking micro-computer based on a voice synthesiser and a braille reader is very sophisticated but the company's marketing director could see no possible military use for the equipment(6).

44. Such is the bitterness that this type of case engenders that Norman Tebbit, Britain's Secretary of State for Trade and Industry, said of the principle governing American trade regulations, that the United States should "put it in a nice, leather-covered book, leave it on a shelf somewhere and let it get covered in dust"(7). Brian Oakley the Director of a L350 million computer research programme - the Alvey project - said that "if things don't improve the two communities will drift apart. I would hate to see that happening. We both benefit from co-operation(8).

45. The following extract from a recent article in the British "Sunday Times" illustrates the types of restrictions imposed on West-West technology transfer at the research and development level.

> "Both Mrs. Thatcher and Helmut Kohl, the West German chancellor, have protested to the Reagan administration about its latest efforts to check the flow of technology to the Soviet bloc.
> America's European allies are threatened on two fronts. A Pentagon crackdown on the flow of data is said by scientists to be threatening scientific advance, and the administration is seeking tougher sanctions against companies that break American export embargoes.
> British scientists are being denied access to American laboratories, seminars and research papers; and American research institutions have been told not to publish the proceedings of some recent conferences. The restrictions go far beyond military technology. British scientists describe the position as "potentially explosive", pointing out that the American defence department is now describing the whole area of biotechnology as strategically important.

The Pentagon is proposing controls on Metals - the acronym for its "militarily-significant emerging technologies awareness list" - which, scientists say, covers virtually everything at the forefront of research.

An informal report, prepared last month by the (American) Academy of Sciences, charges that the administration - which it says has produced no evidence that open scientific discussion has damaged US security - is pressing for controls which will seriously restrict western scientific work. It particularly criticises bans on the presentation of papers at conferences and on hiring foreign researchers in certain fields"(9).

46. As mentioned previously, United States export legislation is also unpopular with the American business community. Proposals made in January this year by the Commerce Department to tighten regulations further were almost universally condemned by United States businesses. The proposed rules were described as "severely damaging" to American exports, "unequivocally disastrous" to the country's economy and likely to "exacerbate the friction" between the United States and its major trading partners. According to many companies, the proposed new rules would have crippled American competitiveness and would either have duplicated rules already in force or not have been sophisticated enough to achieve the aim of preventing the illegal diversion of sensitive technology to the Eastern bloc(10). As a result of these criticisms, in September the department of Commerce proposed a new set of rules which was greeted more favourably by American businesses. The new regulations affect distribution licences which authorise exporters to make multiple shipments over an extended period under a single export licence, instead of licensing each shipment individually. With distribution licences, companies would be required to be "self-policing", ensuring themselves that their products would not be illicitly diverted to the Eastern bloc. Compliance would be monitored by a series of random audits conducted by the Commerce Department, backed up by criminal and civil penalties for companies doing business -- knowingly or unwittingly -- with technology smugglers. Under the new regulations, however, more products would be excluded from the multiple licensing procedures. Semiconductor production equipment, digitally controlled equipment, some oscilloscopes and electron and molecular beam equipment export licences would have to be approved individually in the same way that many goods -- ranging from aircraft replacement parts to nuclear processing equipment -- are under existing regulations.

47. Essentially, the purpose of the new regulations is to balance the need to prevent diversion of sensitive technology with the need to ensure competiveness in foreign markets. This is to be achieved by concentrating resources on the most critical areas while making procedures easier for dealers in less sensitive technology. The Department of Commerce is appraising reaction to the new proposed regulations and hopes to implement them in January 1985.

48. This shift in policy by the Commerce Department, however, does not mean that the United States is relaxing overall export procedures. Indeed, the reverse is true. Within the Pentagon, responsibility for reviewing exports has been shifted from the Undersecretary for Research and Engineering to the Deputy Assistant Secretary of Defense for International Economic, Trade and Security Policy. The Research and Engineering office works closely with industry and is sensitive to the preference for less restrictive controls, whereas the International Security Policy office favours more restrictions. In addition, the Pentagon has been given authority to review a wider variety of goods and also to examine exports to non-communist countries where diversion of technology to the Eastern bloc is thought to be most prevalent. These new measures do not grant the Pentagon a veto on exports : in the event of a conflict between agencies over particular licences, the President would make the final decision. Not surprisingly, American business reaction to what it sees as further bureaucratic interference with trade has been unenthusiastic.

H. TECHNOLOGICAL COMPETITIVENESS

49. There are two conflicting approaches to East-West trade and technology transfer : a restrictive approach and a liberal approach. The restrictive line takes the view that trade with the Eastern bloc facilitates its military build-up by providing technology and thereby freeing resources which can then be devoted to defence. The denial of the trade, therefore, may compel the Soviet Union to divert resources away from the defence sector in order to support the ailing civil economy. The more liberal line is that trade is an unwieldy and ineffective instrument with which to pursue political objectives. So long as the Soviet acquisition of specifically military equipment is prevented, that is sufficient[11]. Generally speaking, the United States Administration takes the former line while Western Europe and many American companies take the latter. These differing perspectives can cause a host of difficulties, some more obvious than others. The acrimony caused by the Siberian gas pipeline issue is probably the best-known example, but there are many others, such as those described earlier, where West-West technology transfer has been impeded. It will be argued later in this Report that several policy initiatives could be taken which would greatly alleviate the disagreements on technology transfer. However, in order to appreciate these fully, it is necessary to examine, briefly, another area of concern which relates to the exploitation of technology within the Alliance.

50. A major concern of European governments is that Europe is rapidly losing its ability to compete internationally in the marketing of high technology goods. This concern is well founded. In 1978, Western Europe acquired a $500 million trade surplus in high technology trade; by 1982, there was a $10 billion deficit primarily as a result of imports from the United States and Japan. In electronic microprocessing, Western Europe has captured only 10% of the world market whereas the United States and Japan command 80% between them[12].

51. Europe's disappointing performance in high technology markets is due to many factors. An important point to note, though, is that neither scientific and technical capabilities nor the level of funding for research and development (R. and D.) is to blame. R. and D. expenditure in the European Community was about $40 billion in 1980, compared with $43 billion in the United States and $15 billion in Japan. In all cases, this is equivalent to approximately 2% of Gross National Product. That is not to say that the shape of the European R. and D. effort is ideal : a nationalistic approach to R. and D. leads to a duplication of effort which means that scientific and financial resources are inefficiently employed when the European R. and D. effort is viewed as a whole.

52. Essentially, Europe's high technology problems are due to two principal factors : nationalism and an inability to transform technical ideas into successful technological innovations. Nationalism is probably the greatest hindrance and it manifests itself in many ways. Europe's hotch-potch of national safety, design and technical standards effectively impose a tariff of about 10% on all goods traded within the European Community : almost 800 complaints that technical standards are being used to curb imports are on file at the European Commission. Consequently, manufacturers tend to focus on domestic markets. For instance, nine different telecommunications switchgear systems operate in Western Europe, and there is virtually no trade in them in Europe. This narrow focus means that individually, companies cannot keep up with American and Japanese pace-setters because they cannot afford the same investment in R and D. Cooperative R and D, however, is also hindered by nationalism. Governments, for the best of reasons, attempt to protect jobs rather than seek a division of labour based on technical considerations. Even when solutions are found, political wrangling can impose delays which allow competition to move still further ahead. It is worth looking in some detail at an example in the aeronautical field which illustrates this vividly.

53. In the United States, NASA has almost completed a new type of computer to predict air flow over proposed designs. Indeed, a second generation of this type of computer will be introduced in 1987. This will produce even better, faster and more comprehensive predictions. To complement these computers, NASA is also constructing a new type of wind tunnel - a cryogenic wind tunnel - which will make experiments with models far more realistic. In Europe, however, research programmes are fragmented and an effort to cooperate on a programme equivalent to NASA's cryogenic wind tunnel is stalled as the United Kingdom, France, West Germany and the Netherlands cannot agree on a location. As for the computer simulation of aerodynamics, there is no unified European effort, so the American effort goes virtually unchallenged. According to an editorial in Flight International, however, the Americans "are ready to share the work on cryogenic wind tunnel testing and might be prepared to share the computer research... if Europe could produce a useable

facility." The calculations needed for computer simulation are so complex, and the market is expected to be so large, the Americans "will be pleased to share out the work, but cannot do so until the European effort ceases to be fragmented and becomes well enough organised to undertake a realistic workshare." Flight International concluded that "the benefits of such a combined Euro-USA wind tunnel aerodynamics research computer and cryogenic programme would be inestimable. The flow of air over moving surfaces is still an incompletely understood art; the solutions to these problems will become increasingly valuable, both to aerospace companies and to the researchers who can produce those solutions. At present the Americans are way ahead. The Europeans could still compete, and could even cooperate -- but only if they first organise, and then apply, themselves."(13)

54. In part, nationalism is responsible for Europe's other high technology problem, relative inability to innovate. As noted earlier, some R. and D. is duplicative and small, national markets limit the scope for mounting the very large R. and D. effort required in some fields. This, however, is not the whole story. Europe is simply not as good as the United States and Japan at getting technology out the laboratory and into industries. Academics traditionally have been unenthusiastic about becoming involved in industry and this attitude is changing only slowly. Contacts between academic institutions and the business sector remain relatively poor. Furthermore, Europe is not producing enough technologists in the fields required by industry. In 1982, or instance, less than 1000 electrical engineers graduated from German universities and Italy's educational system is only expected to provide 10% of the information specialists that industry will require over the next decade (14). Another problem for potential innovators is the shortage of venture capital in Europe. At a conference of over 200 European chief executives 83% of the executives felt that venture capital -- and the managerial skills that often accompany it -- was important for financing high technology investments. Funds from the European Economic Community and from banks were also felt to be important but only by 20% and 35% respectively.

55. Despite Europe's difficulties, the picture is not all bad. Europe's technical expertise is beyond doubt, and there are many examples of innovative success. But Europe has the potential to do much better, a fact which is recognised by governments. There are repeated calls for more cooperation between nations, and many European governments are putting more money into high technology research and providing venture capital funds. The European Commission is also trying to lay the foundation for future information technology development by funding a research programme known as ESPRIT in conjunction with European computer companies. However useful such initiatives will no doubt be, there is reason to believe that much more could be done.

56. In the first place, the European Community does not include Iceland, Norway, Spain, Portugal, Turkey and Canada and it does include Eire, a non-Alliance nation. Clearly, initiatives seeking to promote greater technological cooperation with the United States should embrace these nations. For example in a visit to Canada earlier this year, the Sub-Committee on Advanced Technology and Technology Transfer witnessed many instances of Canadian technological excellence which clearly demonstrated that Canada has much to offer in collaborative projects. In addition, military R. and D. is a very significant element in many nations' R. and D. efforts but is omitted from European Community activities. Furthermore, the survey of European chief executives mentioned earlier indicated a much higher degree of interest in transatlantic cooperation than in intra-European cooperation. Of course, efforts to promote greater intra-European cooperation should be pursued and might facilitate greater transatlantic cooperation but policy initiatives giving equal emphasis to cooperation with the United States would probably be greeted with more enthusiasm by industry.

57. Proposing that the Allies should seek closer cooperation with the United States in high technology begs two very important questions. Firstly, what would the United States have to gain? Second, how could greater cooperation be achieved. The answer to the first question is -- perhaps surprisingly -- quite straightforward. The United States is not immune from increasing R. and D. costs, nor is American technology superior in all areas. The United States could benefit from having access to European technological expertise, by reducing United States/European duplication in R. and D., and by sharing R. and D. costs. Furthermore, projects involving European partners have a much better chance of gaining acceptance in European markets, promoting economies of scale and standardisation. These benefits are especially important in the military sector. Weapons incorporating "emerging technologies", for instance, would be purchased by Europe much more readily if European industry had a share in their development and production. In aerospace, in particular, greater cooperation could be useful. In this area Europe and the United States are -- by and large -- technological equals. Projects are expensive though; more pooling of resources could lead to lower development costs, larger markets and lower unit costs. This in turn would allow procurement of greater numbers for a given expenditure and would also promote greater standardisation leading to greater operational efficiency.

58. Transatlantic cooperation is, of course, already taking place on a government-to-government basis and on an industry-to-industy basis but, as with intra-European cooperation, the situation could be better. But achieving greater cooperation is easier said than done. The impediment which is most relevant to this analysis is the problem of technology transfer.

I. TECHNOLOGY TRANSFER: RESOLVING THE DISPUTE

59. From the discussion of technology transfer problems presented earlier in this report, it is easy to see how sharing technology within the Alliance is no simple matter. There were encouraging signs earlier this year when it was announced that agreement had been reached at COCOM on new export controls for a variety of high technology items. The agreement specified what sorts of computers could be exported to the Eastern bloc and also laid down which computers could be sold at "national discretion". Controls were also agreed on sophisticated telecommunications equipment and -- for the first time -- agreement was reached on the export of computer software. The new agreements are a welcome development but unfortunately they fall far short of resolving the differences of opinion on technology transfer. Since agreement was reached there have been numerous protests in Europe about American export controls. American export licence requirements have delayed the sale of a $21 million computer to Japan. In Germany, the Economics Minister Martin Bangemann, warned Washington that Bonn would "not tolerate further attempts to restrict technology transfer and would, if necessary, legally prohibit its companies from complying with 'extraterritorial' restrictions imposed by a foreign nation". Austria declared that it would resist American pressure to adopt export curbs on advanced technology items. France and the United States are at odds over the possible sale of telecommunications equipment to Bulgaria. A West German research institute has accused the United States of using its export controls as a protectionist tool. In Belgium, the proposed sale of machine tools to the Soviet Union was the source of disagreement with the United States. The European Community industry ministers informally agreed that U.S. policy was hindering technology transfer, and the European Commissioner for industry stated that "we are going into a major fight with the U.S. which will make chicken-feed of our agriculture dispute.

60. Clearly, the Alliance is still at odds over the technology transfer issue. So what can be done about it?

61. The first thing that should be done is a major revision of the Military Critical Technologies List (MCTL). The MCTL describes the technologies which should not be exported to Eastern bloc nations and also includes technologies to which non-Communist nations have only limited access. As mentioned previously, the MCTL is criticised because it is cumbersome and includes technologies which are available elsewhere. Only this year did the U.S. Department of Commerce create a small division to examine what technologies are easily obtainable abroad and to include this appraisal in technology transfer rulings. This is a welcome development but does not go nearly far enough. The United States, in conjunction with the Allies, should rigorously assess which technologies on the MCTL are only available in the United States. Furthermore, this assessment should not be on a purely component-for-component basis; functional equivalence should be the

yardstick. If item "A" on the MCTL is not available elsewhere, but an item "B" is and performs an equivalent function, there is no point in restricting item "A". Essentially, what is called for is a large-scale technology "audit" to establish which technologies on the MCTL can in fact be controlled by the United States, which technologies are already available to the Allies, and which technologies are even more widely available.

62. Rationalising the MCTL would be a profoundly useful step. Enforcement resources would not be wasted in attempts to control technologies which are available elsewhere. Consequently, genuinely critical technologies could be monitored more efficiently. A rationalised MCTL would also prevent a lot of unnecessary acrimony between the United States and the Allies.

63. Another initiative which would greatly assist in coordinating Alliance technology export procedures would be to "streamline" and harmonise domestic practices for evaluating technology exports. Technology exports are administered in different ways by the Alliance nations. Generally speaking, departments responsible for trade, foreign affairs and defence all provide input on East-West technology transfers, though still more departments -- up to 14 in the United States -- may be involved. In some instances responsibilities can be diffuse, making nation-to-nation contacts unwieldy. If each Alliance nation created its own Technology Transfer Bureau with ultimate responsibility for technology transfer this could have considerable benefits. All interested parties -- Defence, Trade, Foreign Affairs etc.-- could provide their input for each particular case, allowing the Technology Transfer Bureau to see all points of view. The Bureau's senior staff might consist of representatives from all interested parties to ensure balance. International dealings would certainly be made easier since by focussing responsibility in one office -- and relegating other departments to acting in advisory capacities -- negotiations would be less complex. Certainly this initiative might meet bureaucratic resistance -- no department likes losing "turf" -- but it would not be expensive: manpower could be provided by those departments involved in technology transfer and the number of staff need not be large. (COCOM has operated for years with a staff of less than thirty).

64. Another useful technology transfer initiative is already in hand: the expansion and streamlining of COCOM. Details are surprisingly scarce but it appears that for many years, office space, staff and equipment have been barely adequate.

65. The initiatives suggested above would all help alleviate the Alliance's technology transfer problems, but they would not solve them. A resolution of the technology transfer dispute, however, may not be as elusive as is often supposed. The stumbling block is that the problem is generally analysed too narrowly. Instead of looking solely at technology

exportation policies, the Alliance should look more broadly at technology exploitation policies. The existing focus concentrates attention on the direct costs of the differing approaches to technology transfer but, in reality, what should be examined are the opportunity costs. This clearly requires some explanation and the best place to start is by briefly looking at the areas of agreement on East-West technology transfer.

66. All the Allies are agreed that products, production techniques and expertise which directly contribute to the Soviet Union's technological ability in the military sector should be embargoed. At the other end of the scale, there is some disagreement but a concerted effort combined with a dispassionate appraisal of the overall technology market could probably resolve the differences relatively quickly. This is in the areas of trade and technology where the military relevance is negligible or where alternative, non-Allied suppliers exist. In these areas the effort to prevent trade is fruitless: the goods are freely available elsewhere on the world market and enforcement resources would be better applied in more critical areas.

67. That leaves a substantial middle-ground corresponding to dual-use technologies i.e. technologies which can be used for either civil or military purposes When it comes to East-West technology transfer, the American Administration tends to favour restrictions across a much wider range of dual-use technologies than do the Allies. Consequently, the United States places restrictions on the export of those technologies to the Allies. This limits the scope for transatlantic technological cooperation which so interests European -- and American -- governments and businesses. Clearly, the dispute over technology transfer is costing Europe -- and the United States -- a great deal because opportunities for cooperation are being missed. In other words, dual-use technologies which, precisely because they can have many applications, are being under-utilised. One respected commentator on Alliance policy matters described this situation in the following manner. "In numerous fields, military and civil technology are getting more alike. That ought to mean greater scope for the civil exploitation of military technology, and hence more spin-offs from defence R. and D. (or more spill-over benefits, in the economist's less dramatic terminology). It ought also to mean more scope for the adoption by armed forces of the fruits of civilian innovation. In short, better value for defence budgets all round. Yet governments appear, by some of their actions anyhow, to be intent on actually extending the domain of the "defence-related" or "militarily critical" into whose mysteries even friends can be admitted only on a strict "need to know" basis. This is nonsense: and pernicious and expensive nonsense at that. Unless we keep our wits about us we could squander opportunities by insisting that they be considered problems. 'Dual-use' technologies ought to be giving planners not pain but pay-offs"(15).

68. These observations reveal the true costs of the technology transfer dispute. The European nations -- and many American businesses -- argue that tight controls on East-West technology are expensive in terms of lost exports. The American Administration argues that more liberal controls would be expensive in terms of increased funds for defence R. and D. -- and procurement -- to counter a more rapid increase in Soviet military capability. But both points of view ignore the costs of not agreeing on a common export policy: unnecessary duplication of R. and D. in both civil and military sectors; inhibiting of cooperative R. and D. efforts; lost opportunities through the under-exploitation of technology.

69. A unified approach to East-West technolgy transfer is essential. Without it, the Alliance bears the -- literally -- incalculable cost of under-exploiting its technological resources. That suggests that for both the United States and the Allies, it would be worthwhile making more sacrifices than they are prepared to make at present. Quite simply, all parties must realise that they have much to gain by achieving a compromise on East-West technology transfer. The Alliance must agree to draw the line -- or lines -- somewhere on what can and cannot be exported to the Eastern bloc. It matters more that a line be drawn than where that line is. By agreeing on a common external export policy, the Alliance could then liberalise intra-Alliance trade policies and reap the benefits that new technology offers.

70. In order to make a compromise as attractive as possible, a major effort should also be made to promote and coordinate the Alliance's exploitation of technology. This could be embodied in an Alliance Technology Agency whose purpose would be to establish the ground rules for intra-Alliance technology transfer, coordinate civil and military R. and D., and stimulate innovation. This Agency could also perhaps assume COCOM's duties.

71. Essentially the agency could provide an R. and D. information and coordination service for the Alliance nations. By studying the shape and scope of various national programmes, the agency could suggest "trade-off" projects to alleviate the difficulty of choosing the lead nations in particular R. and D. efforts. For instance, taking the example of the cryogenic wind tunnel discussed earlier, it would be much easier to select a host nation for the project if the other participating nations could be offered the opportunity of hosting other projects in other fields. The agency could act as a "clearing house" for R. and D. proposals from governments by notifying the relevant competent bodies in each Alliance nation of R. and D. requirements. By monitoring R. and D. activities in each nation, the agency could also identify opportunities for collaboration which otherwise might go unnoticed. The agency could also suggest a "division of labour" in R. and D. areas. The Working

Group on Technology, Growth and Employment established at the 1982 Versailles Summit Meeting has already successfully performed this function in several areas. In advanced robotics for instance, it has subdivided research such that Germany and the United States concentrate on civil engineering applications, Italy on space applications, and the United Kingdom and France on mining applications. The agency could propose such divisions of labour on an Alliance-wide basis across a variety of technologies. Furthermore, if industrial R. and D. efforts and requirements were reported to the agency, these could be coordinated with public and private programmes in other nations. The agency should also employ -- on its staff or as consultants -- people with expertise in a variety of high technology businesses to facilitate the agency's ability to spot research initiatives which may be of particular use to industry. (Academic researchers are often unaware of the potential applications of their work and an R. and D. monitoring organisation should be able to help here).

72. Defining the form, roles and responsibilities of an Alliance Technology Agency should be accorded the highest priority. A commitment to establish such a body would underline the urgency of solving the technology transfer dispute. Instead of concentrating on the costs of achieving a compromise, the Alliance nations might start to become aware of the costs of <u>not</u> achieving one.

73. In conclusion, then, these are some of the actions that could be taken to try to resolve the technology transfer dispute.

(i) The Military Critical Technologies List should be revised to take account of the foreign availability of currently embargoed technologies. This should be based on functional equivalence rather than precise matching of component for component. One estimate suggests that foreign availability could be as high as 85%. Even if this proves to be exaggerated, an attempt to rationalise the MCTL could allow the more effective application of enforcement resources and would also decrease the number of unnecessarily embargoed technologies, thereby reducing acrimony among the Allies. Also by, reappraising the MCTL, the United States would then be in a stronger position when attempting to justify embargoes.

(ii) The Alliance nations should create Technology Transfer Bureaux with responsibility for controlling technology exports. It was reported last year that in the United States, European companies wishing to acquire U.S. technology had to deal with 14 different offices in Washington. If each nation focussed responsibility into one bureau, international -- and corporate -- negotiations would be streamlined.

(iii) The Alliance nations should concentrate on the costs of the current dispute in terms of lost opportunities for collaboration and all that that implies. By concentrating only on the direct, short-term costs of achieving a compromise the Alliance nations are not sufficiently motivated. They should realise that while the dispute continues, the opportunity costs also continue.

(iv) The Alliance should create an agency to coordinate R. and D. efforts. If this were created before a compromise is achieved on technology transfer, this agency would probably very quickly be able to provide many examples where technology exploitation is being inhibited. This would provide additional motivation for the Alliance to settle its differences. In any event, such an agency would facilitate a more rationalised Alliance R. and D. effort.

74. The execution of any of these policy initiatives would cost money, but it would be money well spent. The West's military budgets are already inflated by programmes needed to counter Soviet advances made with the assistance of Western technology. Research and development budgets are also inflated by duplication and a lack of coordination. Economic growth is also being inhibited by the Alliance's failure to exploit its technological resources to the full. These policy initiatives would enable the Alliance to find the optimum balance between the costs of exportation and the benefits of exploitation. In addition, they would reduce the scope for intra-Alliance disputes thereby contributing to Alliance cohesion. The question is not "should the Alliance implement these policies" but "can the Alliance afford not to?"

(1) For an informative description of many of the following examples see Richard Perle's "Technology and the Quiet War" Strategic Review Winter 1983 pp.29-35.

(2) "35 Spy Cases in Silicon Valley Being Probed, U.S. Aide Says" International Herald Tribune 22-23/10/83.

(3) "High-Tech U.S. Exports Pose Dilemma for Policy-Makers" Congressional Quarterly 26 March 1983 pp.609-614.

(4) "How Should U.S. Counter 'Steal American' Effort" Chicago Tribune 27 September 1982 Sec. 4 p.6.

(5) "Red Scare Computers "New Scientist 14 July 1983.

(6) "Micros caught in Red Scare" The Sunday Times 1 April 1984.

(7) "West Counts the Cost of Computer Ban" New Scientist 23 February 1984 pp.12-13.

(8) Ibid.

(9) "Reagan's New Trade Ban Scares Europe" The Sunday Times 11 March 1984. Also see "High-Tech Embargo Gives Free Range to 'Cowboys'" Financial Times 15 March 1984, "Europeans Angry Over U.S. Moves For New Technology-Export Curbs "International Herald Tribune 24 January 1984, and "MP Protests at 'Unfair' U.S. Curbs" Financial Times 14 April 1984.

(10) "U.S. Export Curb Proposals Draw Fire From Business" Financial Times 24 April 1984. See also "Congressman, Defence Official Clash Over Curbs on High-Tech to Soviet" International Herald Tribune 21-22 January 1984.

(11) This analysis is drawn from a prepared statement by Dr. Angela E. Stent presented in "The Premises of East-West Commercial Relations" Report of a Workshop sponsored by the Committee on Foreign Relations, United States Senate and the Congressional Research Service. CP 1561 December 1982. pp.159-164.

(12) Much of the data and argument presented in paragraphs 50 to 52 is drawn from "The High-Tech Challenge", Time 16 July 1984 pp.26-31., and collection of articles in the Wall Street Journal, 31 January 1984 covering a conference of European chief executives.

(13) "Europe's Tunnel Vision" Flight International 5 May 1984, p.1189.

(14) "Europe's High-Tech Struggle" Newsweek 28 March 1984 pp.8-13.

(15) David Greenwood "Technology Transfer - The Policy Problem" NATO's Sixteen Nations Feb.March 1984 pp.65-68.

Appendix

Resolution 156

On Technology Transfer

The Assembly,

Recalling its 1983 Resolution (146) on East-West Technology Transfer, which stressed the need to formulate a coherent Alliance approach to the export of high technology goods to the Eastern bloc;

Concerned by the acquisition and exploitation of Western technology by the Eastern bloc to enhance Soviet and Warsaw Pact military capabilities;

Agreed that the flow of Western technology to the Eastern bloc must not be permitted to compromise Western security;

Welcoming recent agreements at the Co-ordinating Committee on Multilateral Export Controls (COCOM) for regulating exports of certain high technology items; but

Convinced that actions must be taken outside the COCOM framework in order to harmonise fully the Alliance nations' high-technology export policies ;

Aware of difference of opinion between Alliance nations over the export of high-technology goods;

Concerned that these differences of opinion are restricting the transfer of technology between the Alliance nations and limiting opportunities for collaboration in high-technology projects;

Disturbed by unnecessary duplication in Alliance civil and military research and development efforts;

Persuaded that a more rationalised Alliance research and development effort would be facilitated by resolving the different approaches to high technology exports;

Recognising that although the Assembly's Sub-Committee on Advanced Technology and Technology Transfer has only just started its work, it is still convinced that immediate action can be taken;

Appendix

Resolution 156

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Disturbed by unnecessary duplication in Alliance civil and military research and development efforts;

Persuaded that a more rationalised Alliance research and development effort would be facilitated by resolving the different approaches to high technology exports;

Recognising that although the Assembly's Sub-Committee on Advanced Technology and Technology Transfer has only just started its work, it is still convinced that immediate action can be taken;

URGES member governments of the North Atlantic Alliance:

1. to consider the added expense, in terms of effort and resources, of the disagreement on technology transfer policies, and to assess the savings and benefits of reaching a compromise on these policies;

2. to consult with the United States in a reappraisal of the Military Critical Technologies List in order to decrease restrictions on technologies which are already available outside the United States;

3. to consider the creation, in each Alliance nation, of a Technology Transfer Bureau to assume overall responsibility for dealing with high-technology exports, and to report their views to the Assembly;

4. to consider the creation of an Alliance Technology Agency to harmonise research and development in the Alliance nations in order to rationalise the Alliance research and development effort by identifying opportunities for collaboration and reducing unnecessary duplication, and to report to the Assembly on the action taken.

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